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LOW BACK PAIN*

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Pain in the lower part of the back is one of the most common of complaints. It rivals headache and stomach ache in frequency as a symptom in medical histories; and it offers, as do these others, unlimited possibilities of interpretation. Arising from a multitude of causes and varying in the disability which it produces from slight discomfort to complete invalidism, it merits careful study. Much progress has been made in the last quarter-century both in the differentiation of the various kinds of backache and their underlying causes, and in more effective prevention and treatment. While these advances are most gratifying, much still remains unknown. Most of the studies on backache have been either statistical surveys or critical discussions of one or at most, a few causes of this symptom usually from the limited point of view of one medical specialty. There is great need at the present time for a careful analysis of the accumulated data with an attempt at a comprehensive discussion of the causes of pain in this region, and their treatment.

While pain may be present in any portion of the back, when backache is mentioned, we usually think of it as pain in the lower part of the back since this is its most common location. A consideration of the anatomy and mechanics of the spine will show readily why this should be so. Apart from the lower cervical spine the lumbar spine has more visceral attachments either directly or indirectly than any other portion of the vertebral column. Many organs, which in the light of recent neurological investigation[1] can no longer be regarded as silent, have their nerve supply largely from this spinal segment. Again, the freely movable lumbar spine is attached to the relatively fixed pelvis, with the spine usually balanced on an inclined plane at the lumbosacral joint. Both the torso above the pelvis, and the legs below are attached to the low back and pelvis by powerful groups of muscles. These anatomical arrangements make the low back peculiarly liable to suffer injury or to serve as the locus of referred pain.

Age and sex does not provide any relative exemption from back pain although it is more commonly found in middle age and in the later years. The great capacity of youth for adjustment and the surmounting of disabilities, with probably greater resiliency of muscular and ligamentous tissues may be the reason for this. Both sexes, according to the most recent surveys, seem to be attacked with about equal frequency. Our concept of backache as chiefly a feminine disability,[2] gained largely from romantic Victorian literature, must be modified in the light of medical knowledge coming with the rapid industrial expansion of the present century. Except in acute disease either systemic or with involvement of the abdominal or pelvic viscera, low-back pain is not often found in children, and when it occurs it is usually of short duration. Actual disease of the lower spine, e.g. tuberculosis, formerly common in children, is now fortunately becoming more rare.[3]

Etiology

If we should attempt to enumerate all of the causes of pain in the low back we could indict at one time or another every disease mentioned in textbooks of medicine.[4] An array of names of diseases would add only to confusion, so a discussion will be given only of the more common causes, arranged in groups as far as this is possible. We can readily divide pain in the low back into two types, according to the origin of the pain; referred pain, that is, pain arising from disturbances in other structures and giving rise to sensations in the lower back; and local pain, arising in the spine or its supporting structures. In the first group (referred pain) the cause will usually be an infection, a neoplasm or a functional disturbance elsewhere in the body, usually in the abdominal or pelvic organs. In the second group (local pain) the cause will most commonly be a strain of ligaments, muscles, or fascia, in the lower back, or a disease of the low lumbar spine or sacrum with their articulations.

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A closer study of referred, low-back pain will permit of further subdivision about as follows: general infections, visceral lesions, and neurological disturbances. General infections when accompanied by prostration and fever, practically always lead to pain in the lower part of the back. Such pain is usually only vaguely localized and passes away with recovery from the infection.[5] Even the common cold, if sufficiently severe, is apt to bring this symptom. The explanation usually given for such pain is weakness producing a mild strain of the muscles and ligaments in the back. In certain instances, particularly typhoid and influenza, an actual invasion of the muscle by the disease may occur.[6] This is also seen in such parasitic infections as trichinosis.

That diseases in the abdominal or pelvic viscera can lead to the symptoms of pain in the low back is conceded from a formidable mass of clinical and experimental evidence. It is believed that any organ supplied by nerves arising from the lumbar and sacral segments of the spinal cord may give rise to pain in the lower part of the back. As an explanation of referred pain from visceral lesions, we can do no better than to quote from Head:[7] "A painful stimulus from an organ is conducted to that segment of the cord from which its sensory fibers are given off. There it comes in close connection with the fibers for painful sensation from the surface of the body which also arise from that segment. But the sensory and localizing power of the surface of the body is enormously in excess of that of the viscera and thus by what might be called a psychical error in judgment, the diffusion area is accepted by consciousness, and the pain is referred to the surface of the body instead of the viscera actually affected." Whether afferent sympathetic nerve fibers from viscera can play a rôle in referring pain to the surface of the body is still an unsettled question, with the evidence at present suggesting that they do.[8]

Many organs are known from clinical observation to be factors in producing pain referred to the low back. The usual ones are the urinary tract, the lower bowel, and the male and female genital organs. The upper abdominal viscera receive their nerve supply chiefly from the lower thoracic nerve roots so that pain from these organs is rarely if ever referred to the low back. Pain from intestinal irritation or obstruction is usually fairly widespread and is paroxysmal, frequently called "colic." Pain in the low back from gastro-intestinal lesions is usually the result of a localized non-obstructive lesion such as a neoplasm or an ulcer, usually in the large bowel. Peritonitis, while it can cause pain in the low back, practically never does this alone unless there has been a recent perforation along the lower, posterior abdominal wall. A retrocecal appendix has been known to give pain in the lumbar region. But in all of these, pain is rarely localized to the back alone but tends to be diffuse and projected more commonly to the anterior abdominal wall. Diseases of the kidney, ureters and bladder give rise to pain in the low back somewhat more frequently.[9]

Disease, or malposition of the uterus, and disease in other portions of the female genital tract may produce pain in the low back. Graves,[10] in a study of five hundred gynecological cases, concluded that retroversion and genital relaxation were the chief causes of backache in gynecological lesions. The pain was commonly referred to the sacral region. In this he was confirmed by the studies of Lynch,[11] and of Bullard,[12] who mentioned also as less frequent causes of backache, uterine myomata, tubal and ovarian disease, and malignant neoplasms of the female genital tract. Cervical carcinoma, particularly in the later stages, produces severe pain in the low back.

In the male genital tract the prostate and seminal vesicles have been mentioned most frequently as a cause of low back pain, although other portions of the genital tract may occasionally cause it. Young and Gerachty,[13] in an analysis of 385 cases of chronic prostatitis found pain referred frequently along the sciatic nerve or over the sacro-iliac articulations. On injection of the seminal vesicles in certain individuals, pain was referred to the sacro-iliac joints. Carcinoma of the prostate without metastases also at times produces pain in the low back. In these, as well as in other diseases with involvement of the lumbar lymph nodes or retroperitoneal structures, pain may arise from the close relationship to spinal structures.[14].

Before we leave entirely the discussion of pain in the back as the result of visceral lesions, we should consider two other related topics. The first of these is the relation of so-called foci of infection[15] to low-back pain. It is widely believed and supported by a rather meager amount of experimental data that toxins and bacteria can lodge in muscles, fascia, and articulations, and can initiate an inflammatory process there. Such toxins or bacteria can supposedly come from an area of infection elsewhere in the body, or from the gastro-intestinal tract. Osgood[16] has shown that pain in the low back and hip

may be related to intestinal stasis and may disappear when normal function is regained in the large bowel. Others have observed a transient arthritis or "fasciitis"[17] in the low back which was apparently cured by the removal of infection in the teeth, tonsils, or genital tract. While it is entirely possible for such metastatic infection, or intoxication, to occur, it is unlikely that it does so without a previous injury, or inflammation in the tissues which makes them less able to cope with blood-borne toxins or bacteria. In the experience of the writer, and in several large orthopædic clinics, it is looked upon as a possible, but rare cause of low back pain.

The second cause of low-back pain related to visceral disturbances is visceroptosis. Even before Glenard's[18] classical studies, fatigue and pain in the back were known to be a not uncommon accompaniment of downward displacement of the viscera. It is doubtful whether the pull of displaced viscera themselves cause the backache. With more comprehensive review of the problem, particularly in the light of the more recent studies of Keith,[19] Vietor,[20] Goldthwait[21] and Coffey,[22] it is fairly well established that the accompanying muscular weakness and faulty alignment of the whole body, which accompanies the visceroptosis, disturb the support of the spine and produce strain on the back directly. These may also be factors in the backaches associated with displacement of the uterus.

Before we leave the field of symptomatic backaches, we should consider one more cause, if cause it can be called,—the psychoneurotic backache.[23] Almost every medical practitioner of wide experience has seen this type, a pathethic individual born with a nervous mechanism inadequate to cope with the everyday problems of life. In these individuals backache is often only one of many symptoms occurring without adequate clinical foundation. How much of the symptom complex is due to an inadequately functioning neurological equipment, and how much is due to accruing strain from the usually accompanying visceroptosis, inadequate muscular development, and faulty posture, only comprehensive study and therapy can determine. The lower spine represents the line of convergence of all of the sensory nerve fibers from the lower part of the torso and the lower extremities, as well as the lower abdominal and pelvic viscera, and it is common in these individuals to refer pain here.

Certain diseases of the central nervous system have at times been responsible for low-back pain.[24] The pains of tabes and of syringomyelia have, in a number of instances, been referred to the low back, as have also radiculitis and the various nerve-root lesions. Herpes zoster can produce very severe pain in the back, as in any other location. Meningitis,[25] poliomyelitis, and tetanus at times cause this symptom. Tumors of the lower spinal cord, the cauda equina, or the lumbar and sacral nerve roots may give rise to constant and excruciating pain in the low back.[26] Any infection or intoxication of the nervous system in this region can lead to pain. Among the functional nervous disturbances, hysteria can counterfeit disease in the low back.

Infections of the lower spinal column have given rise to pain as they advanced and encroached upon nerve tissue, particularly the posterior nerve roots. Of these infections, chronic arthritis is probably most common. Rheumatoid arthritis of the spine, the Strumpell-Marie type, frequently is often first manifest by pain and stiffness in the lower part of the spine, with its first roentgenological evidence frequently in the sacro-iliac joints.[27] It may cause pain by impingement of nerves in the swelling about the foramina or by actual extension of the inflammatory process to the nerves. In osteo-arthritis pain may come as Gunther[28] has shown, from impingement of nerves by the chondro-osseous proliferation about the vertebral borders, but pain may also arise in this disease from strain as the result of the restricted motion in the spine.

Tuberculosis of the spine,[29] most common, according to statistics, in the dorsal region of the spine, produces pain in the back, either from nerve impingement or from strain after vertebral collapse. Abscess formation, e.g., psoas abscess, rarely causes pain. Osteomyelitis of the vertebrae, a relatively uncommon disease, gives rise to pain when the inflammatory swelling or abscess formation presses upon the nerve roots.[30] Typhoid osteomyelitis or periostitis,[31] formerly not uncommon but now rare, has been mentioned as a cause of low-back pain. Tumors of the spine usually cause pain when their extension leads to pressure upon nerves, or when weakened vertebrae collapse. These are more commonly metastatic tumors.[32] Of such, carcinoma of the breast, uterine cervix, and prostate, hold first rank in statistical studies.[33]

Injuries to the low back, i.e., its ligaments, muscles, joints, and bones, are the most common of all of the causes of pain in this region.[34] Of such injuries, strain is the most frequent. Strain results

from a distraction of ligamentous, or less commonly, muscular fibers. Strains of the back may result from an infinite number of mechanical causes. They may come on acutely from a severe blow upon the low back or pelvis, or from sudden muscular exertion. They may come on insidiously, with gradually increasing lameness. Any part of the back may be affected, depending upon what part is mechanically most weak, and upon the direction and intensiveness of the acting force.

In the low back there are a number of things which tend to make the back less strong. An extremely common one is faulty posture.[35] This does not always lead to back strain quickly since in certain individuals there is greater ability to compensate for malalignment of the spine. Faulty posture plays an increasingly important role in the middle and later decades of life, although it is frequently a predisposing cause in young people. In children, while backache from postural defects may be found, there seems to be sufficient resiliency of ligaments and great capacities of adaptation, and it is usually only as these begin to be lost that faulty posture leads to backache at times associated with relatively fixed postural deformities.

In faulty posture the normal antero-posterior curves of the spine are frequently greatly increased, particularly in the slender anatomic type.[36] The spine is consequently used close to the extreme point of its possible movement. In the low back this is usually extension with the lumbar spine in marked lordosis. The pelvis is commonly tipped forward and the long axis of the sacrum approaches the horizontal. In such carriage of the body there is very little additional movement possible in the direction in which the spine is tilted. In other words, there is "no factor of safety" for motion. Consequently, a sudden force acting upon the spine may bring the spinal joints to the limit of their motion, and strain their supporting ligaments. The strain does not necessarily have to result from a sudden force; long continued use in the position of faulty alignment may lead to a slowly developing, chronic strain.[37]

Scoliosis, whether of the functional or organic type, predisposes to strain in the low back. Except in the more severe degrees of this deformity, there are usually no symptoms in children, and it is only in later life that pain occurs from muscular fatigue, strain, or pressure upon nerve roots.[38] The deformities of the spine in osteochondritis and epiphysitis may also lead to strain of the low back.[39]

In the low back there are a number of conditions which tend to make the back less strong. General muscular weakness is a not uncommon one particularly after long illness. Increasing obesity, sedentary occupation, and insufficient exercise may also lead to impaired muscular tonus and weakness. More lasting in their potentialities to produce strain are the various congenital defects of the low back.[40] Many of these lessen the movement or the mechanical stability of the spinal column and in these ways make strain more likely.

Probably the commonest of these is a difference in the shape and directional slant of the articular facets at the lumbo-sacral articulation.[41] The vertebral articular facets in the lumbar region are usually crescentic in outline and moderately long. They may vary from this and be flat and short on one or both sides. It is generally conceded that the flat type of articular facet is less stable than the crescentic type. This is a predisposing cause to strain of the less secure side of the spine. Changes in the spinal articular facets are sometimes associated with a spina bifida occulta.[42] A numerical variation in the number of vertebrae is also not particularly uncommon. An increase in the number of lumbar vertebrae tends to make strain a little easier while a decrease tends to greater stability of the spine.

Fairly common among anatomical variations are changes in the size and shape of the transverse processes of the fifth lumbar vertebra. Sometimes the fifth lumbar vertebra takes on the characteristics of a sacral vertebra or the first sacral vertebra may be somewhat like a lumbar vertebra. More often there is a wide, lateral projection of the transverse process of the fifth lumbar vertebra on one or both sides. The wide projection usually leads to great stability of the spine on that side so that strain is more probable on the side without this projection.[43] In certain cases an actual joint may be formed with the ilium. At such places an arthritis or bursitis from the development of an adventitious bursa may lead to pain in the low back.

More important, although relatively uncommon, is a lack of osseous fusion of the laminae to the body of the vertebra in the lumbar spine. In such cases a slipping forward of the vertebral body upon the one beneath may occur. This condition, called spondylolisthesis, usually produces a relatively constant pain in the low back, although symptomless cases of this condition have been recorded.[44]

There has been much discussion of the mechanics of forces, acting upon the low back and its articulations to produce a strain. Ingenious diagrams have been made to show the vectors of force upon which ligamentous tear, or, in rare instances, actual subluxation of the joint depends.[45] These studies are of little, or doubtful, clinical value since the direction and extent of the force, as well as the resistance and adaptation on the part of the back are constantly varying factors. An antero-posterior force producing a shearing stress is supposed to be the most common type in both sacro-iliac and lumbo-sacral strains. Fascial and muscular injuries are said to be more common after forceful, twisting motions of the body.

The pathological result of a strain is a distraction of the fibers of ligaments, fascia, or muscle. There is no agreement on what ligaments are involved, and this problem must be left to conjecture since there are few records of anatomical verification of these lesions. It is generally believed, however, that the ilio-lumbar ligaments are commonly involved in strains about the lumbo-sacral joint[46] and that the posterior sacro-iliac ligament with its various digitations is most frequently involved in sacro-iliac, or pelvic joint strains.[47] It is unlikely that only one ligament or only one joint is involved in the severer injuries; the close interrelationship of the various ligaments tending to spread the injury fairly widely.

When strain alone occurs there is slight hemorrhage since ligaments are almost avascular. More extensive hemorrhage sometimes with subcutaneous ecchymoses is found where the bony attachments of ligaments are evulsed. The strain, whatever its severity, is followed by an attempt at repair: edema, the formation of scar tissue, and healing which frequently leaves the ligaments weaker than before.[48] If there has not been adequate support in the healing process, a lengthening of ligaments with subsequent relaxation of the joints may result. This makes for ease in producing later strains. Frequent strain or more or less constant strain in a chronically relaxed joint will lead to contusion of the synovial membrane and later, arthritis, at times with bony proliferation about the margins of such chronically-strained joints.[49]

Radiation of pain about the lower abdomen or into the lower extremity is not uncommon in the so-called lumbo-sacral and sacro-iliac strains. There are a number of theories as to the causation of such pain, particularly along the sciatic nerve, called sciatica. Nerve impingement at the neural foramina from edema or inflammatory exudate, or stretching of the nerve in the original strain, have been mentioned as causes.[50] Stretching of the nerve by the resultant muscle spasm of the pyriformis muscle has been described by Freiberg.[51] Referred pain to the cutaneous distribution from the nerves in the ligaments or articular capsule have been mentioned.[52] It is probable that various of these possible causes play a part in such nerve involvement which often proves to be one of the most persistent and troublesome features in certain injuries of the low back.

Before we leave the discussion of strains, we should consider a special type associated with pregnancy. In pregnancy, and to a less extent during catamenia, there is a relaxation of the pelvic joints.[53] As pregnancy advances this may become marked and cause severe pain in the low back. At times fairly wide separation of the symphysis pubis is observed before or after parturition.[54] Actual upward displacement of the ilium upon the sacrum has been reported. With proper care this relaxation disappears some months post-partum.

Another cause of low-back pain from trauma is fracture either of a vertebra or of the pelvis. Pain may result in the low back from the fracture itself or from the strain and contusion which they produce. Vertebral fractures in the low back are not as common as in the cervical region, or about the dorso-lumbar junction.[55] Fractures of the pelvis, especially if disalignment is produced in the sacro-iliac articulation, are liable to produce pain in the low back. Fractures of the transverse processes of the lumbar spine are relatively common injuries and produce fairly severe local pain. The same can be said for the somewhat rarer fractures of the laminae and spinous processes.

Dislocations of vertebrae or of the pelvic bones which may occur with or without fracture lead to pain in the region, and at times, paralyses. A certain amount of displacement occurs with traumatic or degenerative rupture of the intervertebral disc with extrusion of the nucleus pulposis usually either posteriorly or into the vertebral body. The pathology of this condition has been carefully studied by Schmorl[56] and others. In patients with this lesion in the lumbar spine, observed by the writer, pain in the back, as well as pain radiating down the thigh, was found.

Diagnosis

As in the discussion of the etiology, an extensive list of causes might have been mentioned, so, in diagnosis, an infinite number of tests could be described, most of them helpful to a certain extent, but unnecessary since they duplicate mechanically many simpler maneuvers. The differentiation of the kinds of backache and the finding of the cause in the individual case is often baffling and can be solved only by long and patient study. The first problem is to determine whether the pain arises from the spine and its supporting structures, or whether it is a referred pain. There are a few instances of so-called neurosis, or hysteria, but this is a diagnosis that can be made only by exclusion.

The first requisite is a careful history. This alone will often give sufficient data to exclude many diseases and causes of low-back pain. In seeking for the story of the origin and development of the pain, each physician must follow his own method, but certain facts should be elicited.[57] The following are probably of first importance: the location of the pain, its severity, and whether it is constant or intermittent, the duration and manner of onset of the pain, and whether any of its characteristics have changed. In symptomatic backaches and in slowly developing strains only an approximate date of onset may be given. If symptoms are intermittent, it is of value to determine their duration and the intervals of time that the patient is free from pain.

The patient will usually have some opinion of the cause of the pain. A knowledge of the way in which the pain first occurred with some idea of the acting causes will permit an estimate of its nature and severity. In certain cases, especially where litigation is pending, there is a tendency to exaggerate. At other times symptoms will seem to be more intense from fear and anticipation of a serious disease, especially fear of arthritis or malignancy. Past treatment or advice which at times, unfortunately, has made the condition worse, may also color the patient's outlook.[58]

The past history may offer important leads. In childhood any disease of severity, or one associated with temporary loss of function must be carefully considered. Muscular weakness or deformity may arise from disease in childhood which may lead to disabilities in the back, as may also severe illnesses in adult life. Previous operations, abdominal, or pelvic, may have left in their wake adhesions, recurrence of the original difficulty, or weakness of the abdominal musculature. Removal of a tumor, particularly of the breast, uterus, or prostate, should make one at least keep in mind the possibility of spinal metastases. Previous injuries, especially to the spine and pelvis must be appraised. The susceptibility to infections, the general hygiene, gain or loss in weight, the function of the alimentary tract and the menstrual history are important. Backache associated with previous pregnancies may suggest continued relaxation of the pelvic joints. One should know the type and strenuousness of the occupation, particularly whether it is sedentary or requires much walking or lifting. Finally, the adaptability and mental adjustment of the individual should be learned. Nothing is beneath the attention of the examiner if there is a reasonable possibility that it may aid in arriving at an explanation of the low-back pain.

The family history is of somewhat less importance but, nevertheless, too important to be neglected. The familial history of rheumatism or of tuberculosis may be helpful. A certain type of body build may have been inherited, particularly the very slender type which increases the potentiality to strains. Familial susceptibility to certain chronic diseases may bring opportunities for pain in the low back in their evolution.

In the differential diagnosis of low-back pain, the examiner must remember that he is dealing with a human being with a number of varied parts to his anatomy, all of which should be considered before they are excluded from possible etiological significance. The physician should be a patient and sympathetic questioner, seeking only the truth, and a careful and unprejudiced examiner seeking deviations from the normal in structure and function. The examination will be performed somewhat differently by every physician. It is important only that it be thorough, systematic, and that nothing be missed.

The usual physical examination should first be carried out. This with the history should rule out most of the extra-spinal causes of low-back pain. We shall not go into detail in regard to the general examination, but such points as seem to be of special importance in the differential diagnoses of low-back pain will be mentioned.

An elevated temperature will suggest a general infection, the nature of which can be determined in the evolution of the characteristic physical signs. The skin and subcutaneous tissue may give evi-

dence of a recent gain or loss in weight. Skin lesions as symptoms of underlying disease are sometimes helpful but except in diseases like herpes zoster, they rarely cause low-back pain. A generalized adenopathy may suggest a chronic infection or new growth. An examination should be made for infection, particularly in teeth, tonsils, and sinuses. Infection of the lung both bacillary and mycotic, which metastasize to bone, and those diseases which may produce thoracic deformity must be kept in mind.

In the abdomen the findings of most diagnostic importance for low-back pain are: muscular spasm observed with inflammatory lesions in the abdominal cavity and with acute injuries of the spine or pelvis, lax abdominal muscles commonly seen with faulty posture and visceroptosis, unusual abdominal masses which may prove to be displaced or functionally disturbed viscera, or neoplasms, diastasis of muscles, and hernia. Palpation of the large bowel should be made with such conditions as stasis, dilation, and spasticity in mind. Rectal examination should be carried out particularly to determine the presence of hemorrhoids and prostatic disease, and vaginal examination especially for uterine displacements. The extremities may show swelling, pain, and limitation of motion often evidence of a rheumatoid arthritis. Osseous projections about joints and so-called Heberdon's nodes are usually evidence of an osteoarthritis.[59]

The general physical examination should be followed by neurological and orthopaedic investigation. The neurological examination should be sufficiently thorough to rule out the commoner neurological causes of low back pain, particularly inflammations of the meninges and spinal nerve roots. New growths in the spinal cord are usually diagnosed only after prolonged study. The most severe spinal pains are found where there is pressure upon the nerve roots. Most helpful in the differentiation of neurological diseases are alterations in the normal reflexes, the presence of pathological reflexes, spasticity, paralysis, or atrophy of muscles, and sensory or trophic changes. Organic neurological conditions with low back pain as their only symptom are uncommon. Low-back pain in neuroses and mental disturbances is usually associated with long-continued disability.

For the orthopaedic examination, the gait and poise of the individual should be observed before the clothing is removed. Observe the general musculature, whether flabby or of good tone. The spine is a flexible rod held in the upright position chiefly by muscles. If the muscles are flabby, slumping of the body permitting strain to ligaments is prone to occur. It is well to observe the extremities, particularly for deformity, before proceeding to the back. In the lower extremities strain at the foot or knee may be transmitted to the back, consequently weight bearing should be examined carefully,[60] as well as muscular weaknesses and circulatory deficiencies which may gradually lead to strain.

The appraisal of the general anatomic type[61] of the patient is helpful in differentiating spinal lesions. The slender type with more lax ligaments and greater joint motion more often suffers from strains in the low back and visceroptosis with functional visceral disturbances. The heavy anatomic type with short ligaments and decreased joint motion resists strain better but more frequently develops osteo-arthritis about the spinal joints. Observe how the spine is held from a mechanical point of view. Are the various sections of the body badly poised over the center of gravity? Is any part of the spine habitually held at the extreme of possible flexion or extension? These are evidences of faulty posture, one of the commonest causes of strain of the back.[62]

A lateral deviation of the spinal column may be present. This may be a protective phenomenon attempting to relieve pressure or tension upon injured joints or ligaments or it may be an habitual scoliosis. The differentiation can be made from the history, examination of spinal movement, and roentgenological study. In injuries involving the low back or pelvic joints, the deviation of the spinal column is more commonly away from the injured side.[63] Disease or injuries of the low back are usually accompanied by muscle spasm, either unilateral or bilateral, particularly in the erector spinae group of muscles, which may be observed as ridge-like prominences on either side of the spine.

The movement of the spine should be observed in forward bending, side bending and extension.[64] It is important to know where bending begins. In faulty posture it will usually begin with an increased forward slump of the cervical and upper dorsal spine; in the milder spinal injuries the injured portion of the spine will usually move last. Keep in mind the normal range of motion for the various spinal segments, realizing that the stocky

anatomic type normally bends less than the slender type; and look for any local restriction in motion. Most persons are uncomfortable in bending toward the lesion in lumbo-sacral and sacro-iliac strains, and in bending away from the lesion in muscular or fascial injuries. Similar examination of the spine should be made in the sitting position. This is occasionally helpful in differentiating between lesions of the low lumbar spine and the lumbo-sacral joints, and sacro-iliac strains. Movement in the low back may be less restricted while sitting, in sacro-iliac strains.[65] Sitting, however, relieves most of the lumbar lordosis and sometimes permits freer motion in lumbo-sacral injuries. Twisting motions are of value in more exact location of lesions in the lumbar spine, tension usually coming directly upon the injured part.

One should test for areas of tenderness over and about the spinal column. This is best carried out with the patient standing since in this position tenderness is often more intense from the muscular pull to keep the torso erect. It is well to palpate the spinous processes, the transverse processes, the neck and angle of the lower ribs, and the lumbo-sacral and sacro-iliac joints with their ligamentous supports. In muscular or fascial strains, tenderness is most commonly found along the posterior iliac crest or about the posterior superior iliac spine. The finding of tenderness over any of the chief ligamentous structures supporting the low spinal or pelvic joints is one of the most helpful of diagnostic points and usually indicates strain in that region. In lesions of the sacro-iliac joint, tenderness is more commonly found below the posterior superior iliac spines over the sacrum medial to the sacro-iliac joints or at the sacro-sciatic notch. In lumbo-sacral strains tenderness is more common over the spinous process of the fifth lumbar vertebra or lateral to it.[66] Tenderness over the lower ribs near their spinal attachment is often evidence of intercostal neuralgia.[67] In contusions to the low back there may be local tenderness at times associated with swelling and ecchymosis. In infections in the low back, local heat or, rarely, an abscess may be palpated. In thin individuals abnormalities in bony contour can at times be felt.

Examination of the spine should also be made in dorsal and ventral recumbency, being certain that the position is as symmetrical as can be assumed with comfort. In certain individuals the "knee-chest position" aids in differentiating between lesions in the abdominal wall and intra-abdominal disease, and in back disabilities as well.[68] Where there is a lateral deviation of the spine with marked muscular spasm, there may be a lateral tilt of the pelvis in the lying position, with an apparent difference in the length of the legs, seen more commonly in sacro-iliac strain. However, a short leg may be found without any lateral tilt of the pelvis, where it has been present before symptoms arose, but probably acted, like any other deformity of the lower extremity, as a predisposing factor in strains of the low back. Inability to fully extend the knee is seen with many acute lesions of the low back as well as inflammatory lesions in the lower abdomen. One must be on guard against fixed deformity at hip or knee. Measurements of the circumference of the thighs and calves should be taken, since in long-standing disability in the low back, atrophy of the muscles of the thigh, and to a lesser extent those of the calf is usually found on the side of the lesion.[69]

Much can be learned by testing movement at the hip joint. There is usually pain and limitation of any motion in rheumatoid arthritis of the hip joint which usually involves the spine as well, and some limitation of abduction and internal rotation without pain in osteoarthritis.[70] Flexion of the thigh upon the abdomen, with the knee bent, will commonly be quite painful in low lumbar and lumbo-sacral disturbances, but less painful or painless in sacro-iliac inflammation since here the pelvis moves practically in toto upon the spine. Flexion of the thigh with the knee straight, Laségne's sign, commonly called the straight leg-raising test,[71] causes pain, in sacro-iliac lesions, either referred to the sacro-iliac region or radiating down the posterior aspect of the thigh since with the knee straight the tension of the hamstring tendons upon the ischial tuberosity causes more motion to take place at the sacro-iliac joint. Pain occurs usually in sacro-iliac disease after the straight leg has been raised on the affected side through a very small arc. A much greater arc of motion is possible as a rule on the unaffected side before pain is felt. This straight-leg raising test of which there are many modifications, is of somewhat limited value because of the close interrelationship of low spinal and pelvic ligaments and the frequency in which injuries involve more than one articulation.

Great emphasis has been placed upon the cutaneous radiation of pain by certain students of low-

back injuries.[72] What causes the radiation of pain is still an unsettled problem. A like cutaneous distribution of pain referred from the low back has been given for lumbo-sacral and sacro-iliac lesions apparently after equally competent clinical and anatomical study.[73] Until these uncertainties are removed we cannot use with assurance the radiation of pain to various areas of the lower extremity in the differential diagnosis of low-back injuries.

Roentgenological examination of the spine is most helpful and should be omitted in no case of long persisting low-back pain.[74] Antero-posterior and lateral views of the lower dorsal spine, lumbar spine and pelvis are usually adequate. For special study of displacements or the degree of arthritic changes, stereoscopic roentgenograms may be helpful. If information regarding the spinous processes is desired, lateral views may be taken with the hips acutely flexed upon the abdomen. The vertebral articular facets at the lumbo-sacral junction are best shown with the back rotated fifteen to thirty degrees from the true lateral view.[75]

The evidence obtained from roentgenograms is first of all anatomical. Fractures, osseous displacement, congenital abnormalities or acquired deformities may be shown, as well as a heavy or slender anatomic type of spine. Secondly, except in extremely early cases, roentgenograms will give information of pathological changes. Rheumatoid arthritis frequently begins in the lower spine, particularly the sacro-iliac joints, with decalcification of bone, clouding, and later fusion of the spinal joints, and calcification of the spinal ligaments.[76] Hypertrophic arthritis shows osseous proliferation about articular margins and the edges of the vertebral bodies with no ankylosis and little decalcification of the vertebral bodies.[77] Malignancy usually involves only a small portion of the spine and appears as an area or areas of rarefaction often described as "moth-eaten"[78] or, more rarely, as areas of increased bone density. Infections, e.g. tuberculosis, osteomyelitis, or the mycotic infections will produce areas of destruction in vertebrae, sometimes with surrounding areas of increased osseous density, and less commonly may show abscess formation.[79] Roentgenological studies, particularly of the gastro-intestinal and urinary tract, are also, at times, important confirmatory aids in diagnosis.

Laboratory aids in addition to roentgenological examination, are sometimes helpful. They should not be used indiscriminately, for they do not replace careful physical examination and good judgment. Certain leads will usually be given in the history and examination of the patient so that laboratory tests may be used to answer uncertainties in the affirmative or the negative. If an infection is suspected the usual examination of the blood may aid in appraising the reaction of the individual to the infection, or in determining whether an anemia is present. The sedimentation rate of the red blood cells may help in judging the activity of diseases like chronic arthritis or tuberculosis. The tuberculin test and the Wasserman test, while establishing past infection if positive, do not connect such infection, without further data, to the pain in the low back. Likewise, urethral, cervical, or prostatic smears, and examination or urine and stool can give only confirmatory findings, which, with the history and physical examination, may link the genito-urinary or gastro-intestinal tract etiologically to the low-back pain. Examination of the spinal fluid with pressure studies and the injection of roentgenologically opaque material is only performed in the presence of neurological signs indicating such procedure.

In the present rapid advance in medical knowledge, it is impossible for one physician to diagnose accurately all the conditions which may produce low-back pain. But the well-trained physician should be competent to recognize deviations from the normal in structure and function which may indicate further study with consultation with the appropriate specialists. More than one cause of low-back pain may be present. The physicians' task is to arrive at the most comprehensive diagnosis possible, not only that the immediate disturbance in the low back may be relieved but also that future difficulties in this region may be prevented.

A summation of all diagnostic criteria is not possible. But a brief review of the chief differentiations may be helpful. Statistics show that most cases of low-back pain are due primarily to trauma, to faulty posture and to fatigue. There is fairly general agreement, in which the writer's experience concurs, that pain referred to the low back is less common than local pain. It may be said unequivocably that muscle spasm, localized tenderness, and limitation of motion in the spinal region indicate a lesion in the spine, or its contiguous structures, but this does not exclude extra-spinal lesions as contributory or secondary causes. Acute

traumatic lesions, sometimes self-evident, can be diagnosed usually with roentgenological aid. If pain only is found without any local, protective phenomena in the low back, the source of pain is elsewhere,—the source of the referred pain being usually suggested by the history of symptoms and the physical findings.

Treatment

What has not been tried in treatment for the relief of low-back pain? The cultivation of this fruitful field by nostrum venders and irregular practitioners attests both to the difficulties commonly encountered in relieving this troublesome symptom and to the child-like credulity of human beings. In a review of the previous treatment of one hundred patients suffering from low-back pain, the writer obtained this summary:

Treatment	*No. of Patients*
Medicines, including endocrine products and dietary regulation	40
Spinal support	13
Rest in bed	12
Pelvic operations	7
No treatment	6
Removal of foci of infection	5
Osteopathic treatment	5
Chiropractic treatment	4
Rest in bed and spinal support	2
Manipulation by physician	2
Relief of foot strain	2
Arthrodesis of sacro-iliac joints	1
Exercises	1

The statement of Sir James MacKenzie many years ago that one must know all the causes of a disease before satisfactory treatment can be given, is an axiom for all scientific therapeutics. An accurate diagnosis must first be made if treatment is to be effective and comprehensive. One can even go farther than this. A study carried out by the National Safety Council has shown that, at least in industry, we should take thought for the prevention of many disabilities of the low back by adequate training and supervision of workmen, and of their working environment.[80] Certain gynecologists[81] have suggested that many of the backaches in women might be avoided by proper training and instruction of girls and young women; and the health surveys of such women's colleges as Smith and Wellesley suggest that this is probably true.

The attempts directed chiefly to the prevention of low-back strain in industry have been the correction of the seats of workmen, or a proper level of work table so that excessive fatigue and faulty attitudes might not lead to strain of the low back, and also the examination of workmen at times with roentgenograms of the low back particularly in work requiring heavy lifting;—workmen for the more strenuous tasks being accepted only when posture and musculature were good, and the roentgenograms showed no disease or congenital abnormality which might predispose to spinal injury. Moreover, the National Safety Council has issued posters and pamphlets in regard to posture and the best ways of lifting and carrying heavy objects. Certain of the large insurance companies have also been interested in such projects. In regard to the backaches of women, the departments of hygiene of a few of the women's colleges and certain industries employing many women have attempted to improve the weil-being of the women by health examinations, rest periods, postural exercises, and the correction of gynecological lesions.

In the actual treatment of low-back pain after the cause or causes have been found, each type of case will require its own peculiar therapy. There are a number of backaches accompanying self-limited diseases, for example, certain fevers in which the low-back pain will be found to disappear after the rest in bed which is usually prescribed in the treatment of these diseases. Some patients with low-back pain obviously the result of referred pain from lesions and disturbances of the abdominal and pelvic viscera should be treated for the visceral disturbance. If this is the only cause of the symptoms, the back pain will disappear after the visceral disturbance has been cured. It is not within our scope to discuss at length the treatment indicated in each of these conditions. That is the province of the internist, the urologist, and the gynecologist after the diagnosis has been made. Certain cases will require neurological or neurosurgical aid, and a few, psychiatric assistance. It may be found that several causative factors are active in one case. Here it would seem to be most logical, other things being equal, to treat the more serious lesion first, and afterwards to proceed to the other contributing factors. Experience and good clinical judgment are often necessary in order to know where and how to begin treatment most effectively.

It is evident from the statements already made that no one specialty is competent to care for all cases of low-back pain. Most of them must, of necessity, remain in the hands of the general prac-

titioner.[82] It is essential that he be competent to arrive at an approximate diagnosis, and then call in such additional aid as may be required. Wrong diagnosis and illogical and inadequate treatment have been one of the chief reasons for the flourishing of cults and quackery in the field of low-back symptomatology.

The greater number of pains in the low back, according to available statistical studies, will be the result of strains, acute or chronic, of ligaments, muscles, or fascia. The general principles of therapy are the same for sprains anywhere in the body; rest and support of the over-stretched fibers in a position of moderate relaxation until healing occurs, with the addition of heat and massage, at times, to help in the resorption of exudate, and exercises to strengthen the weakened muscles in the later stages of healing. Experimental and clinical studies have shown that at least several months are required for healing of simple ligamentous tears.[83] This would suggest that our therapy should be prolonged even in the simplest cases.

The spine, because of its peculiar structure, cannot be rested and supported as easily as many of the other joints. Complete immobilization is almost impossible. But relaxation and support are possible with the patient in a horizontal position in bed. The simplest form of splinting is rest upon a firm bed.[84] The ordinary bed can be adequate by placing under the mattress a piece of beaver board about three by three feet under the mid portion of the body, or by placing boards under the mattress. At times rest in bed is not possible, or feasible in the milder forms of strains, and here strapping of the back with adhesive plaster usually with transverse strips extending across the entire posterior aspect of the pelvis above the gluteal crease and the lower lumbar spine should be carried out, with the spine held in the best position for function, i.e., almost complete obliteration of lumbar lordosis. It is important that the strapping be applied as tightly as can be done with comfort. Where the skin becomes irritated readily, painting the area before strapping with compound tincture of benzoin is a distinct help. Such strapping is usually kept in place for about two weeks, and, in all but the very mildest cases, some support to the low back should be continued longer.

When the patient is put to bed the positions assumed by the patient should be those most conducive to the healing of the injury. The patient should be horizontal with no more than one pillow under the head. Relaxation of the muscular spasm and support to the low back can best be secured by a pillow under the knees, and, if lordosis persists, a small pillow or folded sheet under the lumbar spine. The treatment is similar for strains of the lumbo-sacral joint, the sacro-iliac joints, and those which are a combination of these two. In lumbo-sacral strains support must be given to the low lumbar spine. In sacro-iliac strains support of the pelvis, as with a belt, is grateful. Treatment will vary somewhat according to the nature and extent of the injury.

Heat to the low back in any form is helpful; hot compresses, or dry heat from a lamp or baker, hasten the absorption of exudate which always occurs about a strain, relieve muscle spasm, and add to the comfort of the patient. Physicians are divided in the advocating of massage in the treatment of acute strains of the low back. It must be granted that it decreases exudate and improves the local circulation but it probably hinders the healing of torn ligaments. The writer has been in the habit of using massage only in the occasional chronic case where circulation is impaired and muscular exercise is difficult. An objection to massage is that in the later stages of treatment patients have been prone to depend upon it instead of upon properly supervised exercises for the development of strength in muscles.[85] In the acute stages of the spinal injury sedatives may be required to secure muscular relaxation. These vary from the simpler ones to the narcotics. If the injured low back is properly supported, their use is rarely necessary more than a few days.

As soon as the acute symptoms have subsided, exercises should be given to strengthen muscles and improve muscular tone, always with the expectation of a return of normal function.[80] In the severe cases prolonged rest in bed may be necessary with resumption of the upright position when pain and muscle spasm with movement of the legs in bed have disappeared. The time will vary markedly in each case, depending upon the healing. It is better to err on the side of over-treating since recurrence of symptoms when the patient is first ambulatory may necessitate further, prolonged rest in bed.

With simple strains a few days to three weeks rest in bed is usually adequate to relieve symptoms. This is followed by the gradual assumption of the

usual activities, but during this period it is wise to wear some support to the low back to prevent a recurrence of strain since the back is weak and it requires a long period for complete healing of the ligaments. Moreover, support in the form of a reinforced corset or brace can be so applied that it helps correct postural deformities. There are an infinite number of spinal supports, many of them helpful if properly applied. All must be fitted to each individual so that pressure is applied laterally to the pelvis and support is given to lift up the lower abdomen and flatten the lumbar spine. Such supports need frequent adjustments and should be used only temporarily, as a splint is used for any other sprain, and should be discarded when strength is regained and there is no danger of recurrence.

In certain instances, particularly in chronic strains, adhesions will form in and about spinal articulations and muscles will become shortened from protective muscle spasm. In such instances a comfortable position and proper mechanical alignment of the spinal joints may not be possible. To correct this a manipulation of the spinal or pelvic joints may be necessary. The necessity of this procedure can, in part, be determined by observation, and by roentgenograms. If, after rest in a firm bed for a week or two, the low back cannot be flattened while lying in bed, the list of the spine persists, the amount of motion in raising the straight leg has not greatly increased, and lateral roentgenograms of the lumbar spine taken with the thighs flexed do not show an appreciable difference from those taken with the thighs extended, manipulation of the spinal or pelvic joints is usually indicated, provided no local or general disease has been found to contraindicate this maneuver.[87]

Manipulations of the low back are best carried out under general anaesthesia, although spinal anaesthesia has occasionally been used. In manipulation for strains of the sacro-iliac joint the thigh on the affected side with the knee straight is forcibly flexed until it can be brought to a right angle with the abdomen. It is generally conceded that the click originally described by Baer[88] as an indication of a correction of a subluxation, is probably of no significance. In lumbo-sacral and low lumbar strains this same maneuver is carried out on both sides and in addition the thighs with knees flexed are brought over the abdomen, forcibly hyperflexing the lumbar spine. If there is limitation of lateral motion, the pelvis may be rocked laterally upon the lumbar spine. After manipulation is completed the low back is strapped with adhesive and maintained with lumbar lordosis obliterated by pillows under the knees. If prolonged fixation is required, a plaster spica is applied on the affected side with the lumbar spine flat, and with the thigh in slight abduction, and about thirty degrees of flexion.

In certain clinics stiffening operations upon the low back and pelvic joints are advised after a trial of a brace or bed rest for several weeks without relief. The frequent use of such operative measures has led to the unwarranted and almost routine use of them by many unfamiliar with the care of injuries to the low back. In this way a very useful procedure has come into disrepute. In the writer's opinion there are limited and definite indications for fusion operations upon the low back and pelvis. These are: congenital abnormalities which interfere seriously with movement or stability in the low back; destructive disease which will heal most readily with continued immobilization, e.g., tuberculosis; and extreme muscular weakness where return of muscular power cannot reasonably be expected, e.g., poliomyelitis.

A large number of operative procedures have been advocated; lately, muscle cutting operations to lengthen tightened structures and relieve tension, which are too recent for comment. Injection of novocain or saline solutions along the course of the sciatic nerve, or other nerves to which pain was referred, are now rarely employed.[89] Operations have been devised for the removal of very long or deformed transverse processes or thickened articular facets but are rarely indicated.[90] The back stiffening operations are used particularly for the lumbo-sacral or sacro-iliac joints, rarely both. For the low lumbar spine and lumbo-sacral joints the Hibbs type of operation is used for the most part in America.[91] For fusion of the sacro-iliac joints the procedures advocated by Smith-Petersen[92] or Gaenslen[93] are usually carried out. Operations upon the spinal or pelvic joints should be performed only after the alignment of the spine or pelvic bones is the best that can be obtained for function in the later fixed position. It is particularly important to decrease the lumbo-sacral angle, and the lordosis of the lumbar spine before operation.

For the more severe injuries of the low back and pelvis, such as fractures, dislocations, or ruptures of the intervertebral disc, certain modifica-

tions and more prolonged treatment are usually required. The low back is one of the less frequent sites for fractures of the vertebral bodies. In vertebral fractures treatment consists in correction as far as possible of the vertebral contour and support in bed for at least two months.[94] Support to the injured part of the spine either by jacket or brace must be continued for a number of months after the patient becomes ambulatory. In fractures of the transverse process of the lumbar vertebrae, rest in bed with strapping for several weeks, followed by support to the back for one to two months is usually all that is required. In pelvic fractures the treatment will vary with the individual case; correction of deformity and support for at least six months is indicated. Some of the most troublesome and persistent cases of pain in the low back result from pelvic fractures where proper reduction has not been obtained.[95] In dislocations the treatment is similar, after reduction has been accomplished, to that used for fractures.[96] Operations are sometimes necessary to relieve pressure upon the spinal cord or its nerve roots but such procedures do not much concern us in a discussion of low-back pain. Injuries to the intervertebral disc without extrusion of the intervertebral disc into the spinal canal are treated by rest in bed, followed by spinal support. If the nucleus pulposis is extruded within the intervertebral canal, its removal by laminectomy may be necessary.[97]

Vertebral deformity of whatever sort, particularly lordosis, kyphosis or scoliosis, should be corrected if possible, failing this the back should be supported to prevent strain as well as increase of deformity; in the severe cases spinal fusion may be required.[98] In incurable cases like metastatic tumors, with our present imperfect knowledge, support to the spine and radiation of the portion of the back invaded by the tumor seem to offer the most in treatment.[99] In the late stages of spinal, malignant disease, the cutting of nerves or spinal sensory tracts, or massive doses of narcotics may be required to relieve pain.

In general terms we may say that treatment for low-back pain is usually fairly well indicated after a diagnosis has been made. Internal diseases with referred pain require treatment of the viscus causing the pain. Neurological or psychiatric disease when found in low-back pain should be treated by physicians competent in those fields of medicine. The bulk of the remainder are the peculiar responsibility of orthopaedic surgery.[100] Often several factors will be found in one individual and cooperation between several doctors will be needed to obtain cure, the aim being to relieve pain, to cure disease, to correct deformity, and to prevent recurrence of the low-back pain.

Conclusion

Backache, one of the most common of symptoms, arises from a large number of causes. It manifests itself either as local or symptomatic pain. Local pain is due to injury or disease of the spine and pelvis, or their supporting structures. Of injuries, sprains of the muscles, ligaments, or fascia are most common, with faulty posture very frequently acting as a predisposing cause. Of diseases of the spine rheumatoid arthritis and osteoarthritis are most common. In symptomatic backache the cause is usually a disease or functional disturbance in the abdominal or pelvic viscera, the pain being transferred to the cutaneous area of the nerve branches which supply the viscus affected.

The differential diagnosis is often tedious. It must first be determined whether the pain is local or referred. In referred pain, pain alone is present. Muscle spasm, tenderness, and limitation of motion in the low back are indications of a lesion in that portion of the spine or its contiguous structures. Several diseases may be active at the same time in producing low-back pain. This not unlikely possibility requires that a careful physical examination be performed as well as a systematic examination of the spine and its accompanying neurological structures, with such roentgenograms and laboratory data as may be indicated in each case.

Treatment must be comprehensive. One must remember that the patient is an individual with a visceral, neurological, or spinal lesion. The patient's fears and worries as well as his adjustments to difficulties must be considered. Nothing should be left undone which will add to his health and hasten recovery. Treatment should be sufficiently long, realizing that the processes of repair usually take place slowly, and all factors which may aid in preventing a recurrence of the low-back pain should be considered.

(The References cited in Dr. Kuhns' Essay will be found on pages 149-150.)

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THE FISKE FUND PRIZE ESSAY

At the Annual Meeting of the Rhode Island Medical Society held on the One Hundredth Anniversary of the founding of the Fiske Fund, the Secretary, Dr. Wilfred Pickles, announced for the Trustees of the Fiske Fund, Dr. Albert H. Miller, Dr. Roland Hammond and Dr. John E. Donley, that they had awarded to Dr. John G. Kuhns of Boston, Mass., the premium of $200.00, for his Essay on "Low Back Pain." It is the privilege of the JOURNAL to publish this Essay in the present number and, according to the terms of the will of Dr. Caleb Fiske, to supply "each member of said Society with a copy of such Treatise for which premiums shall have been awarded."

It was the hope of the Trustees that on this Anniversary, an essay might be submitted which would rank with those of Usher Parsons, Edward Warren, Hobart A. Hare, Robert W. Lovett, Charles V. Chapin and the other writers who won for the Fiske Fund Essay its early enviable reputation. This hope is well realized in the present Essay. On a topic of common as well as of special interest, Dr. Kuhns has written a dissertation which is not only an exhaustive treatise for the specialist but also an interesting and instructive article for the general practitioner, on a subject with which he comes in daily contact.

For the 1937 Fiske Fund Essay, the Trustees have announced as the subject, "Newer Methods of Prevention and Treatment of Anterior Poliomyelitis." The premium is $250.00. The regulations which govern the competition are outlined in the notice which is printed in the advertising section. In making the award, preference will be shown for the results of original research or investigation. The prize is open to general competition.

A. H. M.

WILLIAM McDONALD, M.D.

William McDonald, Jr., son of a wealthy and prominent manufacturer in Albany, graduate in philosophy of Brown University, at which he pursued special studies in the department of psychology, also a graduate with exceptional honors, in arts and in medicine, of Columbia University, after serving a residency at the Rhode Island Hospital, was appointed psychoneurologist to Butler Hospital.

On the outbreak of the great war, Dr. McDonald surrendered his hospital connections and an extensive consultation practise in psychoneurology for the opportunity of performing a valuable military service. Returning to this country after the war, he was appointed lecturer on neurology at Yale University School of Medicine and filled this position for several years. He next gladly embraced an opportunity for research on infantile paralysis offered him by the Rockefeller Foundation. His zeal for original investigation, his fondness for children, his skill in diagnosis, his ingenuity in devising mechanical methods of treatment, and a disposition free from the restraint of inhibitory conservatism united to produce unusually successful results in dealing with cases of infantile paralysis. This work occupied the remaining years of his life.

Financially independent, with a genial personality, a brilliant mind, ardor for investigation, a singularly unselfish disposition; yet with greatly restricted eyesight, afflicted with the continuous suffering of a hopeless disease, childless, alone, the life of Dr. McDonald seems a tragic one. But he himself was never heard to complain. His friends considered him with wonder as he ignored his own condition and devoted his thought and effort to alleviating the suffering of others. With his effort crowned with such success, the tragic life of William McDonald may yet have been a happy one. On the day of his death, his friend and former patient, President Franklin D. Roosevelt, sent this telegram: "Deeply grieved at the news of our dear old friend's death. It is the end of a lifetime of service to others."

The sentiment of that telegram will find an echo in the hearts of Dr. McDonald's many friends in Rhode Island and wherever his attainments and character were known and appreciated.

AMONG LIFE'S MIRACLES

A physician was once asked what was to him the most remarkable thing in medical experience. It is not easy to review the experience of forty years' practise and medical study but the answer came readily enough: "The resolution of the solidified lung of lobar pneumonia." Even to one familiar with intravascular coagulation, the appearance of the frog's web under the microscope with its transudation of corpuscles, the sweeping away of partially coagulated fragments, the intra-capillary adhesion of corpuscle masses, and hydraulic phenomena which might be likened to log jams in a mountain stream or slush formation in the gutter, so interesting in one's childhood—the resolution into a delicately crepitant sponge of tissue hard as liver, which will sink in water, must ever be recalled as a fascinating and almost miraculous phenomenon. Nor is the deportment of a pneumonia patient at the crisis hardly less remarkable and interesting. Of florid countenance, sterterous respiration, every gasp a struggle for breath, a fight with the grim reaper—and soon quieter breathing, profuse perspiration, a lowered temperature and refreshing sleep for both patient and practitioner. Nor are these any more remarkable than the removal of an enormous fibroid tumor adherent to everything in and out of sight, with much ligation and embroidery, a dry operative field, final closure of the incision and the patient recovering almost without pain and less temperature reaction than might come from a cold in the head. Consider also the extraction of teeth, that terror of our youth—operations under local anesthesia so cleverly instituted that the patient does not know he is being operated upon, or many of the now every day performances of medicine and surgery, and it will be seen that our beloved profession is constantly at work among the mysterious and the miraculous. One recalls the marvels of the birth of a creature from submarine to aerial respiration and the unfolding of the mind as years advance and it is not hard to realize that the astonishing and the romantic is an every day part of our life. Small wonder, then, that the cream of humanity clamor anxiously for admission to our ranks, for permission to enter a life of poverty, self sacrifice and humility, to be part and parcel of a life than which there is no greater usefulness.

W. L. C.

HEALTH OFFICERS

Physicians know that public health administration is a difficult and important specialty and one in which proficiency can be obtained only by long training and experience. In the presence of an epidemic many important questions come up for decision: Should the schools be closed? What quarantine measures should be adopted? How much money should be spent for doctor care, for nursing care, for hospitalization and for serums or vaccines? Every year decisions must be made as to how the available funds can best be used; and the measures decided upon are usually valuable in direct proportion to the quality of the administration and personnel employed.

Excellent health officers are available. For states and cities, physicians, graduates of a school of public health and trained by experience in public health work, are usually the proper candidates, although many older health officers have gained their training by experience rather than early education. If those elected to serve the state or city appoint an unqualified man as health officer, they are guilty of a betrayal of trust.

Good health administration also requires a secure tenure of office both for the head and the other members of the department. A reasonably efficient organization cannot be hoped for if members are dropped for any cause other than failure to do a good job.

We physicians know these things and have an important civic duty to perform in making them clear to the public. This is not written as a criticism of any health officer but as a statement of principle and as a call to physicians to protect our health departments against the less well informed elements in the political parties.

W. P. B.

Personal Notes

The RHODE ISLAND MEDICAL JOURNAL extends glad greetings to the *Journal* of The Connecticut State Medical Society, Volume one, Number one, August, 1936.

Preparations are well under way for the Fall Clinic Day at the Memorial Hospital on November 4. Dr. George M. Piersol of the Graduate School of the University of Pennsylvania will attend and with him will be Drs. Stroud, Bookus, Dunn and others. Dr. C. F. Dixon of the Mayo Clinic is expected to be present. The medical service is preparing a further report on Lorostidin treatment and

a clinical experiment with the new protein insulin for diabetis. Drs. Kelly and Holt will present motion pictures of pyloric stenosis. Dr. Hussey and assistants will show motion pictures of a series of gall bladder cases.

Dr. William Hunter, in 1755-56, delivered in the Old Colony House at Newport, R. I., the first systematic series of medical lectures ever given in this country. August 19, the Providence Medical History Club made its Second Annual Pilgrimage and its members were graciously entertained by Miss Anna Falconet Hunter of Newport, great-great-granddaughter of Dr. William Hunter. They visited the site of Dr. Hunter's apothecary, the house where he lived and his extensive gardens. Old Trinity Church where, in 1760, he was united in marriage with Deborah Malbone, and the home of the Newport Historical Society where many memorials of Dr. Hunter are preserved. His grave in Old Trinity Churchyard bears the inscription:—"In memory of Doctor William Hunter Who departed this Life On the 30th. January, 1777 In the 47th. year of his Age"

The Rhode Island Hospital will be represented at the Second International Congress Against Cancer, to be held at Brussels, September 20-26, by Dr. B. Earl Clarke and Dr. Herman C. Pitts. They sail on the Berengaria on September 12 and plan to return by the middle of October.

Dr. John M. Peters has returned from a visit at Dr. Grenfell's Laborador.

Engaged: Elizabeth Beaman Skelton, daughter of Dr. and Mrs. Creighton W. Skelton, to Donald Philip Lind, son of Mr. and Mrs. Godfrey A. Lind of Auburn.

Married: July 25, Miss Mildred S. Walker to Joseph H. Doll, M.D. Doctor and Mrs. Doll are residing in Pawtucket, R. I.

The American Board of Internal Medicine, Incorporated, has been organized through the combined effort of the American College of Physicians and the Section on Practice of Medicine of the American Medical Association.

The purpose of the Board will be the certification of specialists in the field of internal medicine, and the establishment of qualifications with the required examination procedure for such certification.

The first written examination will be held in December, 1936, and candidates successful in this test will be eligible for the first practical examination which will be conducted near the time for the annual session of the American College of Physicians at St. Louis in April, 1937. The second practical examination will be held at Philadelphia near the time of the annual session of the American Medical Association in Atlantic City in June, 1937.

Application blanks and further information can be obtained by addressing the chairman, Walter L. Bierring, M.D., 406 Sixth Avenue, Des Moines, Iowa.

The next written examination and review of case histories of Group B applicants by the American Board of Obstetrics and Gynecology will be held in various cities in the United States and Canada on Saturday, November 7, 1936.

Application blanks and booklets of information may be obtained from Dr. Paul Titus, Secretary, 1015 Highland Bldg., Pittsburgh (6), Pennsylvania. Applications for this examination must be filed in the Secretary's Office sixty days prior to the scheduled date of examination.

Rhode Island Department of Public Health

Under a plan approved by the United States Public Health Service and with cooperation of the Public Health Service, the Division of Industrial Hygiene now functions as a part of the State Department of Public Health. The establishment of this Division has been made possible through funds available under the Social Security Act. James Philip Deery, M.D., Georgetown University School of Medicine, class of 1932, is director of the Division. William Anthony Mahoney, M.D., Tufts College Medical School, 1917, is Assistant Director.

Since Rhode Island is primarily an industrial state, this Division should play a significant role in the service of the Department of Health. The Division will present an interesting exhibit at the Rhode Island Industrial Exposition to be held at the Cranston State Armory, Providence, September 11th to the 19th, inclusive.

The laboratories of bacteriology and pathology of the State Department of Health announce a change in policy with reference to reporting.

Only positive reports of examinations for diphtheria, hemolytic streptococcus and others of similar character will be made over the telephone. Negative examinations will be reported by mail.

John H. Gordon, M.D., has completed the internship on the Fracture and Orthopedic Service at Rhode Island Hospital and will open his office in August, in the Hall Building, Pawtucket, R. I.

Robert S. Sherman, M.D., completed his internship at Memorial Hospital, Pawtucket and is now at the Long Island College Hospital taking special work.

Edwin B. Gammell, M.D., of East Barnet, Vermont, a graduate of the University of Vermont Medical School; and Lawrence Senseman, M.D., of West Barrington, R. I., a graduate of the College of Medical Evangelists, Los Angeles, California, commenced their internship at Memorial Hospital, Pawtucket, on August 1.

Dr. C. Melvin Bernhard, graduate of the University of Louisville, having completed a one year rotating internship in Lexington, Kentucky and a two years' surgical internship at the City Hospital,

Louisville, Kentucky, began a pathological internship, of one year's duration, at the Rhode Island Hospital on August 15th.

Dr. Knowles B. Lawrence finished his regular rotating internship at the Rhode Island Hospital on August 1st. He is now pathological intern at the New England Deaconess Hospital.

Dr. Edward L. Bosworth having completed a year's pathological internship has begun his regular rotating internship at the Rhode Island Hospital.

Dr. Robert F. Nuessle having finished his regular rotating internship at the Rhode Island Hospital on June 1st is now Resident Physician at the State Infirmary, Howard, R. I.

Dr. Alfred B. Sundquist, who finished his regular rotating internship at the Rhode Island Hospital in October, 1935, is now practising in Manchester, Conn.

Dr. S. Forrest Martin, who finished his regular rotating internship at the Rhode Island Hospital on May 1st, has commenced an internship at the Eye & Ear Infirmary in Boston.

Dr. Reeve H. Betts, who recently completed his regular rotating internship at the Rhode Island Hospital, has commenced a fellowship in Thoracic Surgery at the Lahey Clinic.

Dr. Norman Margolius, who completed his regular rotating internship at the Rhode Island Hospital on February 1st, has commenced a Gynecological internship at Mount Sinai Hospital, New York.

RHODE ISLAND MEDICAL SOCIETY

Minutes of the One Hundred and Twenty-fifth Annual Meeting

(*Continued from page 130*)

Report of the Committee on Necrology

JOHN WILLIAM KEEFE, Providence, R. I. Obituary, Volume XVIII, page 174.

JULIAN AUGUSTINE CHASE, Pawtucket, R. I. Harvard University Medical School, Boston, 1872; past president of the Rhode Island Medical Society; on staff of the Memorial Hospital; aged 86; died Aug. 12, 1935, of chronic myocarditis.

FRANCIS JOHN HIGGINS, East Providence, R. I. Obituary on page 29.

HORACE NEWELL WILLIAMS, Providence, R. I. Obituary on page 95.

FRANKLIN PIERCE CAPRON, Providence, R. I. Obituary on page 95.

RUFUS HERBERT CARVER, Providence, R. I. Obituary on page 105.

EDWARD J. LOGAN, Providence, R. I. Jefferson Medical College, Philadelphia, 1903; member of staff of St. Joseph's Hospital and Homeopathic Hospital, Providence, R. I.; aged 67; died April 8, 1936.

VIRGIL H. DANFORD, Wallum Lake, R. I. College of Medicine, Ohio State University, 1915; Captain, Army Medical Corps; Resident Physician, Springfield State Hospital, Sykesville, Md.; Cleveland Municipal Sanatorium, Pawling Sanatorium, Troy, New York; Assistant Superintendent and Superintendent at Wallum Lake since 1931; aged 47; died April 21, 1936, of heart disease.

JOHN RIDLON, Newport, R. I. College of Physicians and Surgeons, Medical Department of Columbia College, New York, 1878; attending orthopedic surgeon, New York Orthopedic Dispensary and Hospital, and instructor in orthopedics at New York University Medical School; also on staff of Belleview Hospital and Vanderbilt Clinic, New York; later on staff of Northwestern University Medical School, Rush Medical College and others in Chicago.

Dr. Ridlon was one time secretary of the Section on Orthopedic Surgery, A. M. A., and a member of the House of Delegates. He was past president of the American Orthopedic Association and honorary member of the British Orthopedic Association.

Dr. Ridlon was founder and past president of the Home for Destitute Crippled Children, Chicago. He was Orthopedic Surgeon to the Mercy, Michael Reese and Evanston (Ill.) Hospitals and the Newport (R. I.) Hospital. Aged 83; died April 27, 1936.

JOHN LANGDON, *Chairman.*

PROVIDENCE MEDICAL ASSOCIATION

Minutes of the May Meeting

The regular monthly meeting of the Providence Medical Association was called to order by the President, Dr. William S. Streker, on Monday evening, May 4, 1936, at 8:45 P. M.

The minutes of the last meeting were read and accepted.

The Secretary read a proposed resolution contained in a letter from Sherman Amsden, president of Doctor's Telephone Service, Inc., of New York City, relative to the allocation of one wave length throughout the United States for a Radio Paging Service for physicians and surgeons. The Secretary also read a letter from Dr. Olin West, secretary of the American Medical Association, in which it was suggested that no county medical society should adopt the proposed resolution. It was voted that the matter be laid on the table.

The Standing Committee having approved their applications, the following were elected to membership:

Pasquale Vincent Indeglia
Seth F. H. Howes

The President announced the appointment of the following committee for the golf outing: Drs. Bolotow, Buxton, C. Cook, McCoart and McGuirk.

The first paper of the evening was by Dr. William A. Horan, and was entitled "The Backache Problem." The speaker began with a review of the anatomy of the parts involved. The history is very important. A complete physical examination and X-ray of the spine in both planes should be routine. There are two large groups, viz., those due to pathological changes in the bones, and those due to faulty posture. Changes in the bones may be due to tumors, infections, congenital deformities, fractures, Paget's disease, etc. Dr. Horan described cases illustrating the value of X-ray in this group.

The postural cases are easily recognized by history and physical examination. Causes may be toxic or mechanical. The toxic causes may be very difficult to locate.

The so-called "sciatic syndrome" occurs most frequently in males as a result of trauma. Immediate hospitalization, rest in a relaxed position, and traction of the affected side is the best treatment.

The paper was discussed by Drs. Danforth and Hawkins.

The second speaker was Dr. Francis C. McDonald of the Boston Floating Hospital, whose subject was "Clinical Rickets." Dr. McDonald had two main thoughts to present: first, that deficiency disorders may arise from faulty digestion and absorption as well as from inadequate ingestion; secondly, the possible significance that mild deformities of the skeletal framework, including the teeth, may have in influencing the happiness of 70% of patients.

The incidence and severity of rickets reflect the efforts of civilization to nourish the largest number of people. We do not see today the florid rickets seen in Glisson's time. We have better methods of treatment today, but must not become too complacent. There is constant need to change our laboratory methods to meet changing clinical concepts. Dr. McDonald discussed dental caries showing its infrequency in primitive people both ancient and modern, and its great increase with increase in civilization. He described the findings and conclusions drawn from a study of the skulls and teeth of 300 students in 1931-34. There was a very high incidence of dental caries, asymmetry of the skull and face, chronic sinus disease and one-sided nasal obstruction, astigmatism, mal-occlusion, and flat feet. The speaker suggested that the members of the audience examine their neighbors to see the frequency of these defects.

The paper was discussed by Drs. Langdon, Corrigan, and J. Kelley.

The meeting adjourned at 10:40 P. M.

Attendance 93.

Collation was served.

Respectfully submitted,
HERMAN A. LAWSON, *Secretary.*

Minutes of the June Meeting

The regular monthly meeting of the Providence Medical Association was called to order by the president, Dr. William S. Streker, on Monday evening, June 1, 1936, at 8:50 P. M.

The minutes of the last meeting were read and approved.

The Standing Committee having approved their applications the following were elected to membership:

Leo Vincent Hand
Alexander F. Marzilli

The following amendment to the By-laws was proposed by the Standing Committee: That Section 4 of Article ii, entitled "Of Membership" be amended by adding the clause "and pay the first year's dues", this to be inserted in the second line following the word By-laws. The section will then read "Every person elected to membership shall sign the Constitution and By-laws and pay the first year's dues within three months of his notification of election, in default of which said election shall be void." It was voted to make this amendment to the By-laws.

The first paper of the evening was read by Dr. Bertram H. Buxton, and was entitled "Chorea Gravidarum. Report of a Case." The condition is very rare. The speaker reported a case occurring in a 21 year old woman. There is very little in the literature regarding this condition, and there is much difference of opinion. At the Providence Lying-In Hospital in over 50,000 cases admitted in the past 50 years there were but 3 cases. There are two schools of thought — one maintains that it is Sydenham's chorea occurring in pregnancy,

and the other that it is a different disease related to pregnancy. The condition usually occurs in young women often with a previous history of rheumatism or chorea. 25% have recurrences in subsequent pregnancy. Heart disease occurs in 1/3 of the cases. The mortality according to the textbooks is from 25-33%; the latest statistics over past 30 years show mortality of 12.7%. There is no special treatment. The majority of cases are mild and go to term. In the more severe cases it may be necessary to terminate pregnancy and this should be done by the least shocking procedure.

The second paper was by Dr. Walter Weigner who discussed the psychiatric aspects of Chorea Gravidarum. He discussed the case reported by the previous speaker and showed that there was a serious emotional upset with change in personality and a psychosis. On her first admission to the hospital the chorea cleared up very rapidly with psychiatric treatment and when the fear of pregnancy was dispelled. In the second episode there was rapid appearance and disappearance of symptoms with suggestion, and a state of ecstasy after the abortion. A psychogenic element in this condition is strongly suggested. In a review of the literature one finds four main groups:

1. A group in which sham abortion and other spectacular cures produced miraculous results. Illegitimate pregnancy, etc.
2. A group who became well very promptly after abortion.
3. A group with definite psychoses.
4. A large group in which chorea followed immediately after an acute emotional experience.

The speaker concluded that these cases do not represent an entity due to rheumatic infection activated by pregnancy—some are due to this condition but not all.

The papers were discussed by Drs. Partridge, Wells and Chafee.

The third paper of the evening was entitled "Gynecological Contributions of Classical Antiquity" and was read by Dr. Andrew W. Mahoney. It was a scholarly and very interesting account of medicine in the Graeco-Roman Era with a description of the contributions of some of the great physicians and surgeons of that period.

The paper was discussed by Dr. Donley.

The meeting adjourned at 10:45 P. M.

Attendance 78.

Collation was served.

Respectfully submitted,

HERMAN A. LAWSON, *Secretary*

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